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REPORT NO. 780

RELATIONSHIP OF PERSONALITY FACTORS
TO SOCIAL FACILITATION

(Interim Report)

by

Captain David L. Kohfeld, MSC

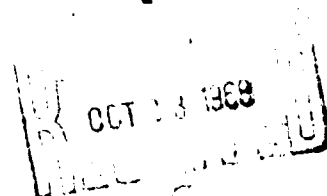
and

William Weitzel, Ph. D.

18 June 1968

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Acknowledgment

The variable-speed treadmill employed in this study was designed by George S. Harker, who also offered valuable assistance and encouragement to the first author during the course of the work. Data collection and tabulation were done by E. Booker McClaskey, who served as E in the Experimenter Audience condition.

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RELATIONSHIP OF PERSONALITY FACTORS
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(Interim Report)

by

Captain David L. Kohfeld, MSC
and
William Weitzel, Ph. D. *

Experimental Psychology Division
US ARMY MEDICAL RESEARCH LABORATORY
Fort Knox, Kentucky 40121

18 June 1968

Biomechanical Aspects of Performance and Performance Decrement
Work Unit No. 022
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ABSTRACT

RELATIONSHIP OF PERSONALITY FACTORS TO SOCIAL FACILITATION

OBJECTIVE

To investigate the relationship between personality differences and differences in susceptibility to the motivating effects of an audience.

METHOD

Five groups of 13, 14, 20, 20, and 18 soldiers served as subjects. Each man was instructed to walk as fast as he could for 10 minutes while being watched by a peer group audience, as compared to when the experimenter was the only observer. The differences between subjects' Peer Group Audience and Experimenter Audience scores were compared with their scores on the California Psychological Inventory.

SUMMARY

It was found that subjects walked faster in the presence of a peer group audience than when an experimenter was the only observer. Peer group facilitation was greater for subjects who scored relatively low on the Re, Gi, To, Ac, and Ai scales of the California Psychological Inventory than for individuals scoring relatively high on these scales. Subjects who were most proficient at treadmill walking received greater benefit from peer group presence than did the less task proficient individuals.

CONCLUSIONS

Personality differences are related to the effects of audience presence. It appears that people who work equally hard for both low and high status observers tend to possess certain positive personality attributes (responsibility, tolerance, good impression, and motivation to achieve) to a greater degree than individuals who are more sensitive to the social status of their audience. The presence of spectators especially improves the task performance of highly proficient individuals while having little effect on their acquisition of the task.

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RELATIONSHIP OF PERSONALITY FACTORS TO SOCIAL FACILITATION

INTRODUCTION

In a review of social facilitation studies, Zajonc (10) concluded that the presence of spectators impairs the acquisition of new responses but enhances the performance of previously learned skills. This generalization apparently holds for both audience effects (the case where changes in behavior result from the presence of passive spectators), and co-action effects (behavior changes resulting from the presence of others engaged in the same activity as the subject). In view of several possible means of studying social facilitation (audience vs. co-action conditions; learned vs. unlearned responses), the present investigation was primarily concerned with studies of audience effects where a well-learned behavior was utilized as the criterion variable. For example, Travis (9) reported that subjects performed a pursuit rotor task with greater accuracy when an audience was present than when they worked alone. More recently, Fraser (4) found that British Navy enlisted men made fewer errors during a vigilance task when the experimenter remained in the testing room. Bergum and Lehr (1) also studied vigilance performance and reported that National Guard trainees correctly detected more signals when a lieutenant colonel or master sergeant would occasionally observe their performance. Clearly, these studies indicate that the presence of others enhances task performance.

A noteworthy aspect of the aforementioned research is that no attempt was made to explain individual differences in susceptibility to audience presence. In Fraser's experiment, a comparison of the mean number of errors indicated superior performance when the experimenter was present, but only 7 out of 18 subjects contributed significantly to the main effect. An inspection of Travis' data reveals that only 10 out of 22 individuals improved their performance by 4 percent or more when an audience was present, the remaining 12 subjects showing little or no increase. Bergum and Lehr presented only group means to support their conclusions. In order to understand more fully the processes underlying the phenomenon of social facilitation, it would seem that greater emphasis should be placed on the responses of individuals to the presence of others.

The work of Ganzer (5) appears to be a step in this direction. With serial learning as the criterion, he found that audience presence was

more detrimental for high- than for low-anxious individuals, a result which is consistent with Zajonc's (10, 11) arousal interpretation of audience effects. Of more immediate concern for the present research is the implication that personality variables may correlate with social facilitation. Accordingly, the present study was designed to investigate the personality attributes of individuals who worked harder in the presence of a peer group audience than when an experimenter was the only observer.

METHOD

Subjects

Five consecutive groups of 13, 14, 20, 20 and 18 soldiers served as Ss. The program of experimentation was such that the groups were assigned to the laboratory sequentially; each group served in succession and there was no chance for social contact among the groups. For purposes of cross-validation, the data from Groups I-III (N = 47) were combined in order to make a comparison with data collected from the combined Groups IV-V (N = 38). All Ss had just completed basic training and were in good physical condition.

Apparatus

A variable-speed treadmill was chosen for the present research for two reasons: (a) treadmill performance requires continuous involvement of the individual with the task, thus providing a dynamic situation where personality factors should be apparent, and (b) previous research has demonstrated that highly reliable measures of performance can be obtained from a treadmill whose velocity is directly responsive to the walker (3, 7). The mechanism which regulated the velocity of the treadmill, and the equipment used to display and record S's walking speed were designed to give him as much latitude as possible in regulating his work output. Specifically, the treadmill drive consisted of a constant-speed motor with an electromagnetic clutch; variations in the voltage applied to the clutch resulted in concomitant changes in treadmill speed. S had continuous control over the clutch by means of a potentiometer device which was activated by his either moving forward or dropping back while walking on the treadmill. The potentiometer was calibrated to provide continuous acceleration or deceleration of the treadmill at the rate of 0.17 mph per 1 in. of S movement. Feedback of treadmill speed was provided to S by a meter registering mph, mounted at eye level. The voltage changes produced by a tachometer-generator which was coupled with

the treadmill drive were fed into a voltage-to-frequency converter whose output was integrated and registered each minute by an electronic counter calibrated to read in mph.

Procedure

The same procedure was followed for each of the five groups employed in the study. The first three days of treadmill walking were devoted to task familiarization. During this time, Ss were given at least 5 min. each day to practice accelerating and decelerating the treadmill, and to practice walking at various speeds, as indicated by the display meter. From the outset it was emphasized that at no time during the course of the experiment would running on the treadmill be permitted. E satisfied himself that each S had mastered the treadmill task before proceeding to the testing phase.

The following six working days involved Ss' walking for record. When S was performing in the Peer Group Audience condition, E informed him that he was being tested to see how well he could perform for a period of 10 min. on the treadmill. That is, S was told that he had to work for 10 min., and it was up to him to walk just as fast as he could the whole time. During this time, at least six fellow Ss observed the walker as he performed. In addition, E recorded S's walking speed as the counter flashed it for each minute.

For the Experimenter Audience condition, S was instructed to walk as fast as he could for 10 min., but was also informed that this was a practice session for which he would not receive a score. S was advised that this procedure was necessary in order for him to remain in good physical condition for the Peer Audience sessions. E was a middle-aged civilian technician who wore informal work clothing. During the Experimenter Audience sessions, unknown to S, the output of the electronic counter was fed into a printer which was completely hidden from S's view at all times. This allowed for a permanent record of S's walking speed to be taken while E casually observed the walker. Days 1, 3, and 5 involved Peer Group Audience walking, while days 2, 4, and 6 were devoted to Experimenter Audience performance.

RESULTS

Effects of Audience Presence

Figure 1 (next page) depicts mean walking speed as a function of Peer Group Audience vs. Experimenter Audience for Groups I-III.

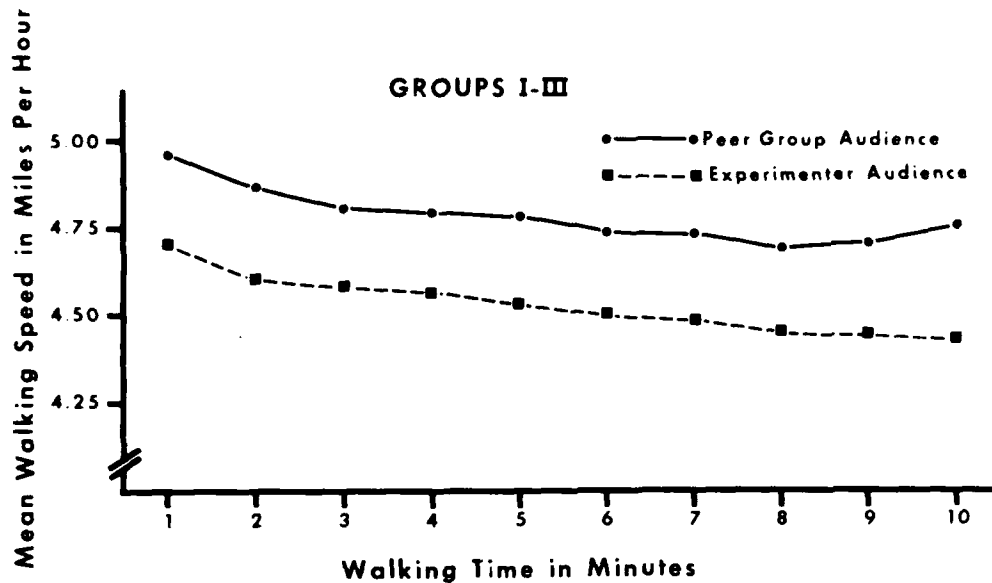


Fig. 1. Groups I-III mean walking speed as a function of audience conditions.

The points on the graph represent the means for minutes 1-10, averaged across Ss and the three sessions for each condition. It can be seen that the work output of the Ss was greater for the Peer Group Audience than the Experimenter Audience condition. Supporting this conclusion were the results of a Groups X Conditions X Sessions X Minutes analysis of variance which indicated the following significant sources of variation: Conditions, $F(1, 36) = 23.59$, $p < .001$; Groups, $F(2, 36) = 5.98$, $p < .01$; Sessions, $F(2, 72) = 6.69$, $p < .01$; Groups X Sessions, $F(4, 72) = 5.25$, $p < .01$; and Minutes, $F(9, 324) = 3.18$, $p < .01$. The main effects due to Sessions and Minutes indicated that treadmill performance tended to decrease over time, both between and within sessions, respectively. The significant Groups effect resulted from Group II walking fastest, Group I intermediate, and Group III slowest. The Groups X Sessions interaction was due to a more rapid decrease in mean walking speed over sessions for Group III than for Groups I and II.

Groups I-III Correlational Analysis

In line with the contention that individual differences are a critical aspect of audience effects, each S's audience scores were examined in relation to those of other Ss. It was apparent that some individuals showed a relatively large discrepancy between their Peer Group Audience and Experimenter Audience performances while other Ss displayed a more consistent output under both conditions. It was hypothesized that the magnitude of this discrepancy in performance was directly related to S's disposition toward working in the presence of his peers as opposed to the case where only E was present. Furthermore, it seemed reasonable that this measure should correlate with the degree to which S displayed certain personality characteristics. Therefore, the differences between Ss' mean performance under the two audience conditions was chosen as a criterion measure with which to compare their scores on personality scales. A test for the reliability of these difference scores, employing the odd-even method for the consecutive minutes in each session (8), produced an r of .93.

Upon completion of treadmill testing, each group was administered the California Psychological Inventory (CPI). Table 1 (next page) presents the r s of Ss' CPI scores with the treadmill criterion. Examination of the Groups I-III correlations revealed a significant relationship ($p \leq .05$) between nine CPI scales and the criterion. The correlations obtained from Groups I-III looked promising; however, it was decided that the results should be replicated before attempting to interpret the correlational findings.

Cross-Validation: Groups IV-V

Figure 2 (page 7) presents the mean walking speeds for Groups IV-V. Again, it is clear that Ss worked harder in the presence of an audience of peers, $F(1, 34) = 30.27$, $p < .001$. Other significant effects were due to Minutes, $F(9, 306) = 66.00$, $p < .001$, and to the Conditions X Sessions interaction, $F(2, 68) = 17.91$, $p < .001$. In view of the significant Conditions X Sessions interaction, the non-significant Sessions effect ($F = 1.20$) indicated that Ss had a tendency to increase their Peer Group Audience walking speeds over sessions while showing a commensurate decrease in Experimenter Audience performance.

The primary purpose of collecting data from Groups IV-V was to cross-validate the correlational data from Groups I-III. The reliability of the difference scores for the present sample was .86. Table 1 shows the correlation coefficients obtained from Groups IV-V.

TABLE 1

Correlations between California Psychological Inventory Scales
and the Treadmill Performance Criterion for
Two Independent Samples

CPI Scale	Groups I-III (N = 47)	Groups IV-V (N = 38)
Responsibility (Re)	- .51**	- .29*
Good Impression (Gi)	- .41**	- .37*
Tolerance (To)	- .34**	- .45**
Achievement via Conformance (Ac)	- .33*	- .28*
Achievement via Independence (Ai)	- .32*	- .33
Self-Control (Sc)	- .18	- .47**
Intellectual Efficiency (Ie)	- .33*	- .17
Socialization (So)	- .16	- .41**
Capacity for Status (Cs)	- .42**	- .06
Sense of Well-Being (Wb)	- .07	- .36*
Dominance (Do)	- .28*	.32*
Self-Acceptance (Sa)	- .13	.39**
Sociability (Sy)	- .27*	.23
Femininity (Fe)	- .14	.19
Psychological-Mindedness (Py)	- .23	.05
Flexibility (Fx)	- .11	.12
Social Presence (Sp)	.01	.13
Communality (Cm)	.07	- .12

*p < .05.

**p < .01.

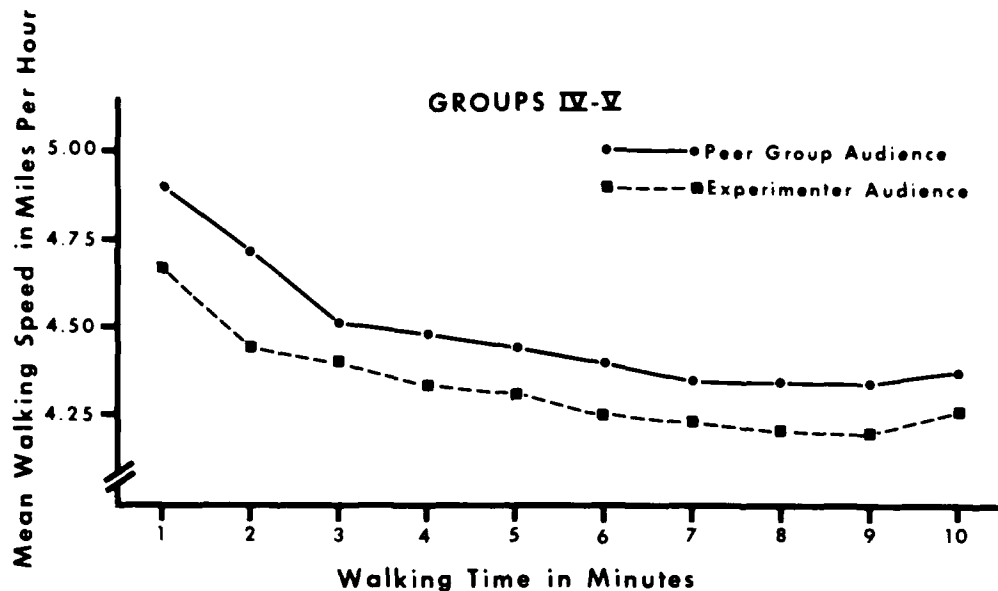


Fig. 2. Groups IV-V mean walking speed as a function of audience conditions.

Cross-validation procedures were evaluated by comparing the r_s for each CPI scale across the two samples. This was done by converting the r_s to z_s (8, pp. 139-140). If the two z_s for any scale were significantly different from each other, the hypothesis of equivalent r_s across samples was rejected. The CPI scales in Table 1 were arranged into two categories: Responsibility (Re), Good impression (Gi), Tolerance (To), Achievement via independence (Ai), and Achievement via conformance (Ac) in category 1, and the remaining scales in category 2. The requirements for inclusion in category 1 were (a) the correlations for the two samples were not significantly different from each other, and (b) both of the r_s for each scale were significantly greater than zero. Correlations in category 2 did not meet both of these requirements. The results of this analysis indicated that S_s who showed the smallest discrepancy between Peer Group and Experimenter Audience performance had a corresponding tendency to score high on five scales of the CPI.

DISCUSSION

The correlations between five CPI scales and the performance criterion supports the contention that personality differences are related to the

effects of audience presence. Specifically, the relationship between Achievement via independence and Achievement via conformance (Ai and Ac) and the criterion suggests that individuals who placed relatively high value on achievement were inclined toward equal performance under both the Experimenter and Peer Group conditions. For the Responsibility (Re) and Tolerance (To) scales, it can be said that Ss who worked equally hard under both audience conditions tended to be more conscientious, dependable, enterprising, and tolerant (6). The correlation between Good impression (Gi) and the criterion indicated that Ss who were relatively more interested in the impression they made tended toward equivalent work output, regardless of who was watching them.

In a post-hoc attempt to describe further the type of person who is susceptible to audience presence, it seemed useful to examine the effects of the audience conditions on Ss who were highly proficient at treadmill walking as compared with those who were less proficient. Accordingly, the Ss were divided into two subgroups: (a) High Max Walk (Ss who were intrinsically more proficient at treadmill walking as measured by the maximum speed at which they could walk before breaking into a run), and (b) Low Max Walk (Ss who were least proficient at treadmill walking as measured by the same criterion). Figure 3 presents the mean walking speeds of the two subgroups for both audience conditions.

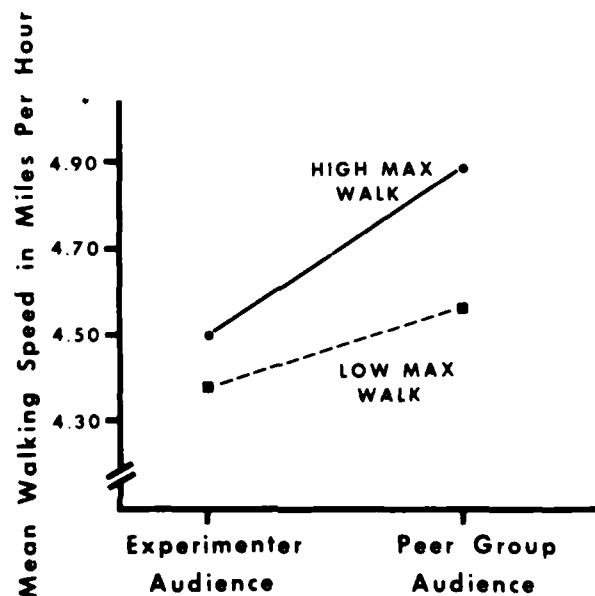


Fig. 3. Mean walking speeds for High and Low Max Walk Ss as a function of audience conditions.

Of particular interest was the relatively greater increase in walking speed for the High Max Walk Ss than for the Low Max Walk Ss when working in the presence of the peer group as compared with the experimenter only. This result received statistical support from a significant Subgroups X Audience Conditions interaction, $F(1, 38) = 7.61, p < .01$. In terms of work output, it appears that Ss who were more proficient at treadmill walking received relatively greater benefit from the presence of a peer group audience than did the less task proficient individuals. It is interesting to compare this result with Cottrell, Rittle, and Wack's (2) recent finding that the presence of spectators had little effect on the performance of individuals who were highly proficient at paired-associates learning. The apparent contradiction in the results of these two experiments can possibly be resolved by noting that the present study examined task performance, whereas Cottrell et al investigated the acquisition of responses. Accordingly, it is suggested that the presence of spectators may improve the task performance of highly proficient Ss while having little effect on their acquisition of a task.

The nature of the relationship between audience conditions and work output deserves a word of further comment. Although a post-test questionnaire indicated that Ss did not consider the scoring procedure to be important, some question remained as to whether the audience effects were confounded with that of Ss' disposition toward scored (peer group) as opposed to "practice" (experimenter) performance. Subsequent work (Kohfeld, 1968, in preparation) has shown that this was probably not the case, as further use of the Peer Group vs. Experimenter design where Ss were conspicuously scored under both conditions revealed similar, if not greater, differences between the two audience conditions.

In conclusion, the findings of the present experiment suggest that the social status or relevance of the peer group was greater than that of the experimenter alone. Furthermore, susceptibility to peer group status was apparently greater for Ss who scored relatively low on the five personality scales than for individuals scoring relatively high on the scales. Broadly interpreted, it appears that people who work equally hard for both low and high status observers tend to possess certain positive personality attributes (Re, Gi, To, Ac, and Ai) to a greater degree than individuals who are more sensitive to the social status of their audience.

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13. ABSTRACT <p>The effects of audience presence on the treadmill performance of 85 soldiers was investigated. It was found that <u>Ss</u> walked faster in the presence of a peer group audience than when an experimenter was the only observer. Peer group facilitation was greater for <u>Ss</u> who scored relatively low on the Responsibility (Re), Good impression (Gi), Tolerance (To), Achievement via conformance (Ac), and Achievement via independence (Ai) scales of the California Psychological Inventory than for individuals scoring relatively high on these scales. The results also suggested that <u>Ss</u> who were most proficient at treadmill walking received greater benefit from peer group presence than did the less task proficient individuals. (U)</p>		

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